REQUIREMENTS FOR AND POTENTIAL OF HYSPIRI FOR REGIONAL APPLICATIONS

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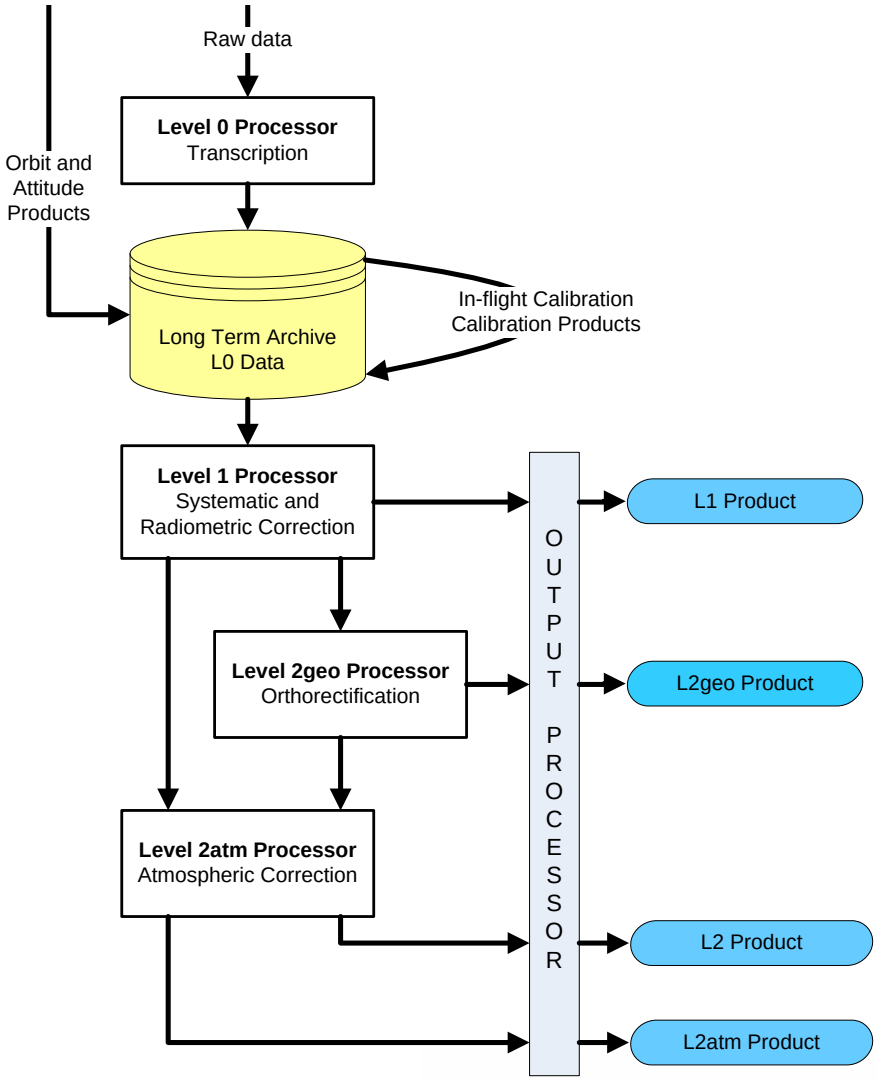
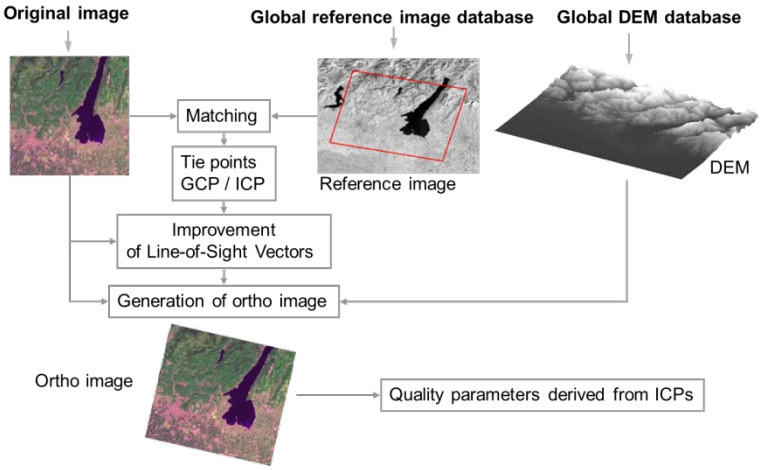
Study Questions

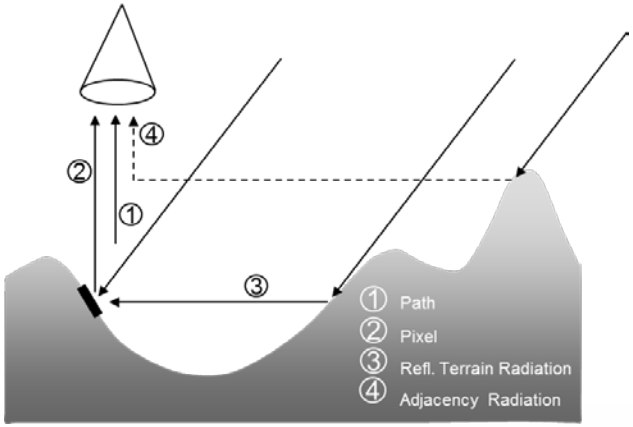
For what application projects would HyspIRI data be used if available today?

How well would the mission characteristics of HyspIRI fit the project requirements?

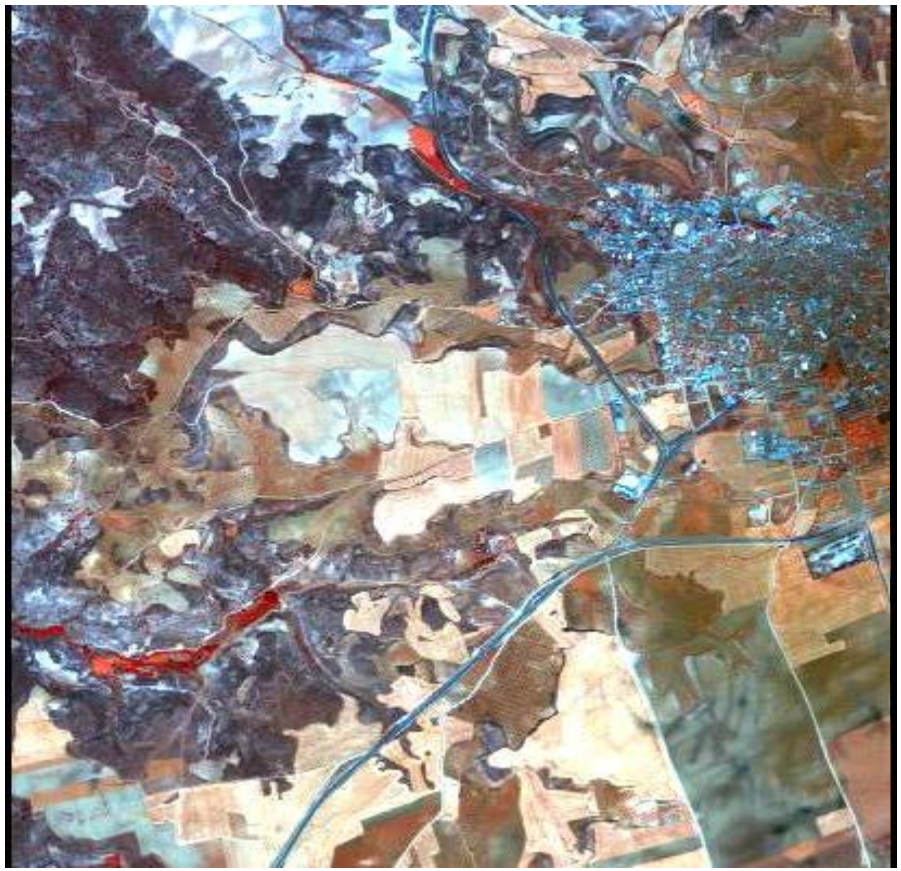
Overview – Pre-Processing Chain @ DLR





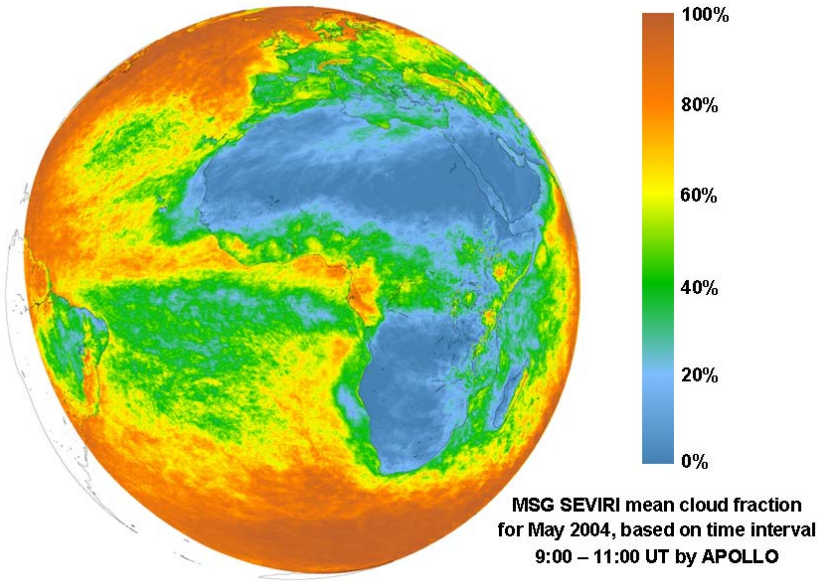


ATCOR: Example of Cloud Shadow Removal



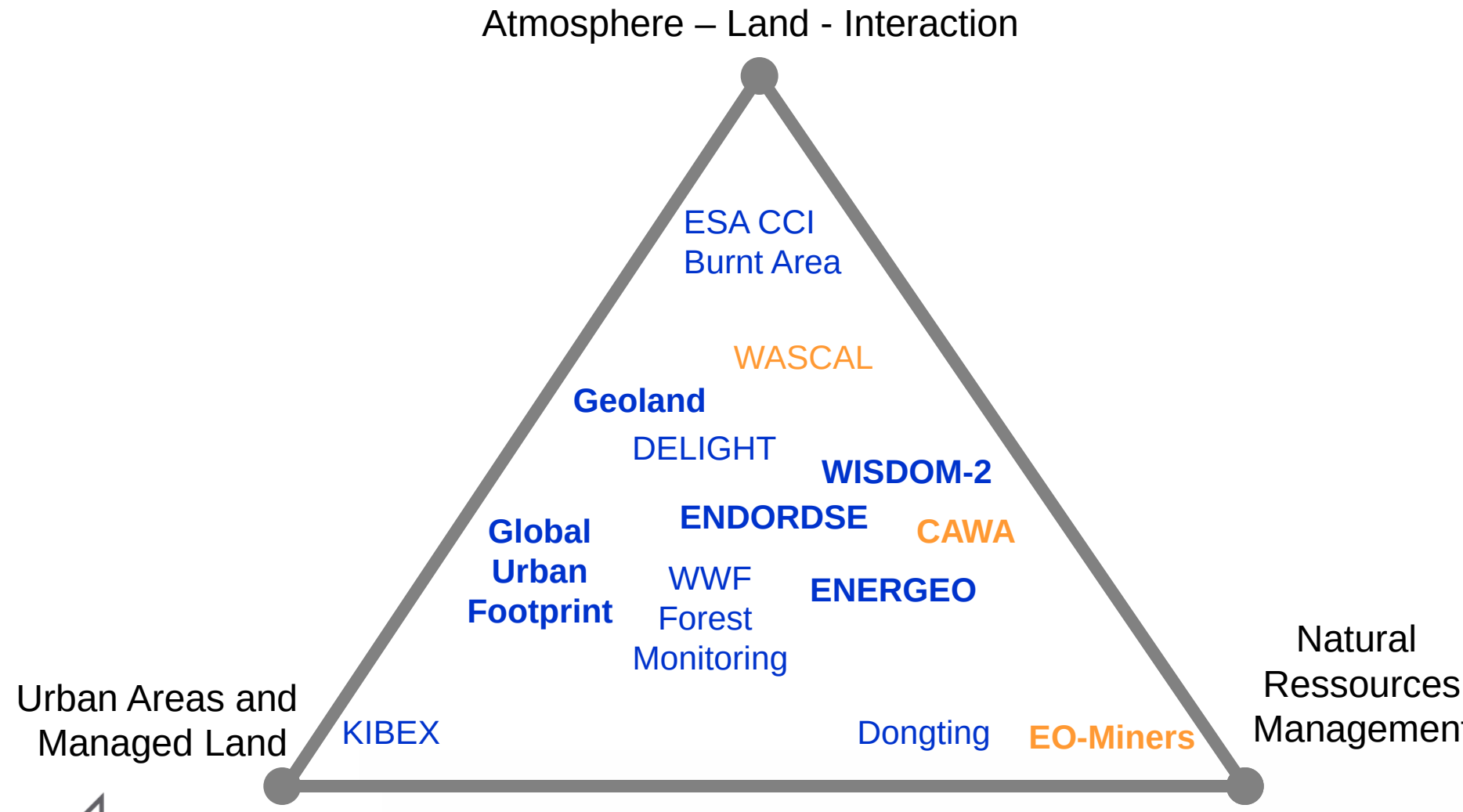
HyMap scene, Chinchon, Spain, 12 July 2003,

RGB=878, 646, 462 nm



Example of Cloud Fraction Product @ WDC

Land Surface Applications at DLR

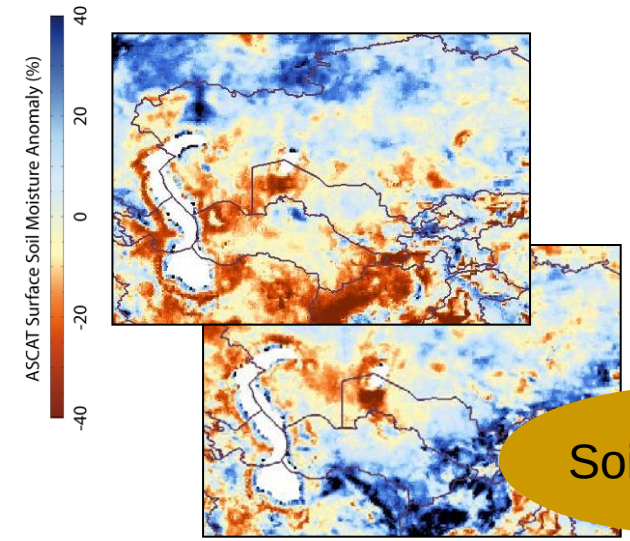


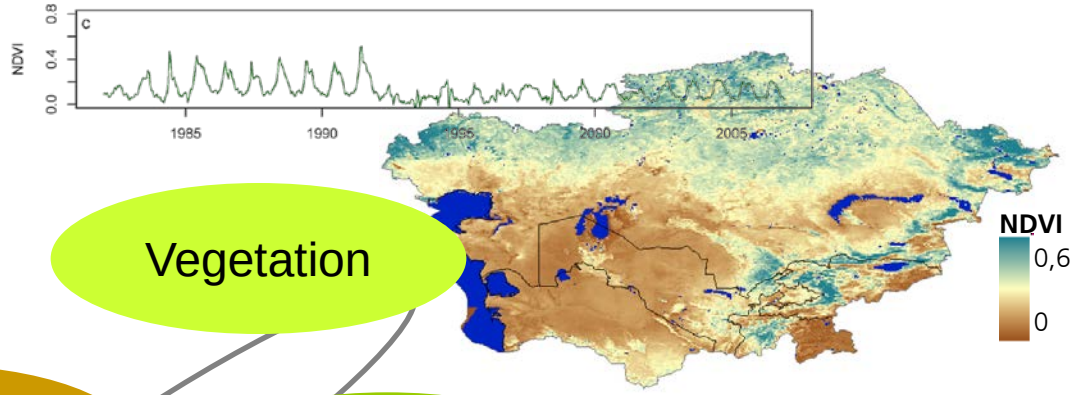
Sensors Used in the Regional Application Projects

- MODIS (time series), MERIS
- Landsat TM
- IRS, Rapid Eye
- WorldView and other very high geometric resolution systems
- SRTM / TanDEM elevation models

- Airborne imaging spectrometer data (> 1000 HyMap scenes archived)

Regional Water Resource Management in Central Asia

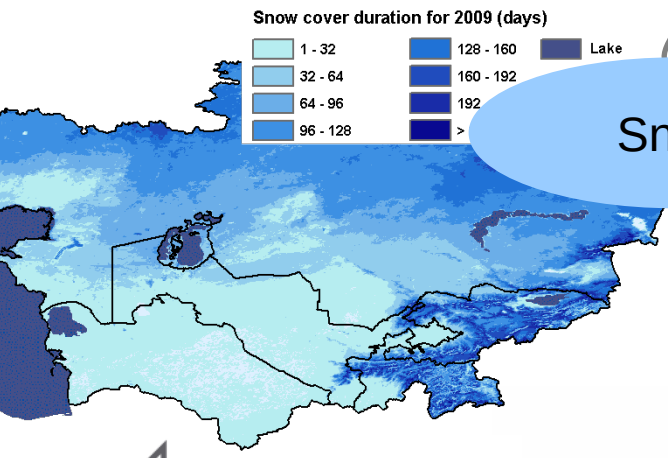




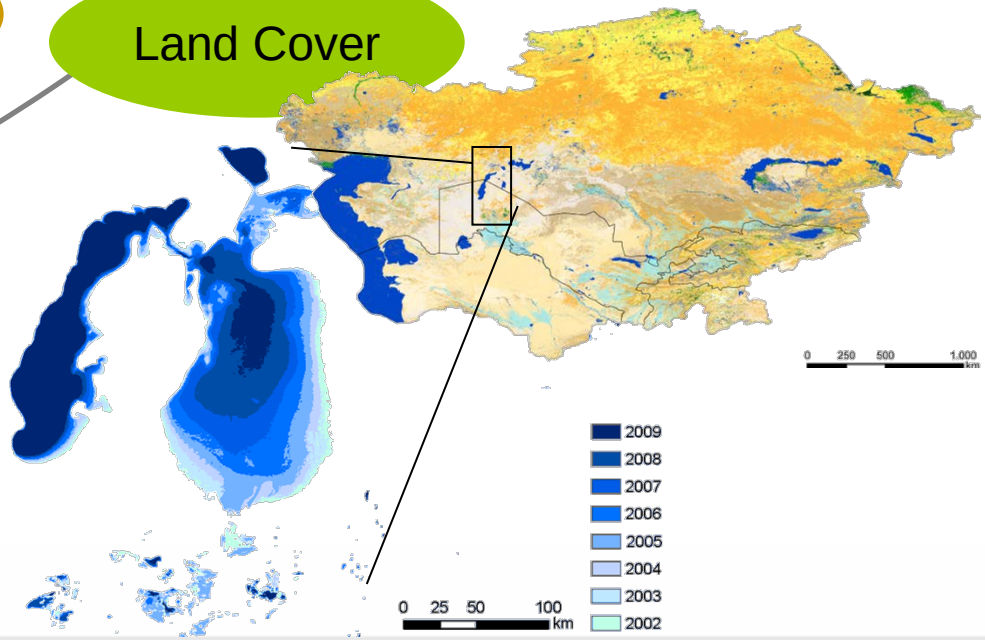
Vegetation

Soil moisture

Land Cover



Snow



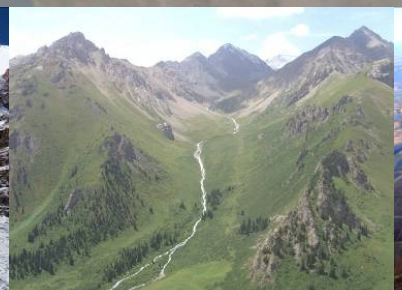
Requirements - Regional Water Resource Management in Central Asia

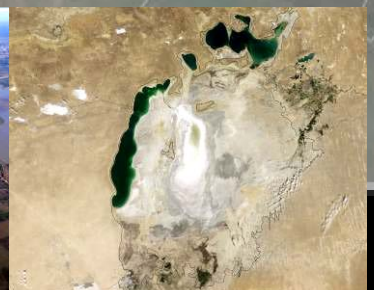
CAWA

snow and ice	• Mapping of **snow cover** and **snow characteristics** for assessing seasonal water storage and availability for downstream regions
vegetation condition	• Mapping of **vegetation condition** based on photosynthetic activity, chlorophyll & other pigment content, water content for drought and degradation monitoring
vegetation cover	• Mapping of **fractional cover** of vegetation in steppe regions and **evapotranspiration** on agricultural land for assessing degradation and interannual variability in relation to rainfall / irrigation water availability
crop types	• Detailed differentiation of crop types for estimating water consumption

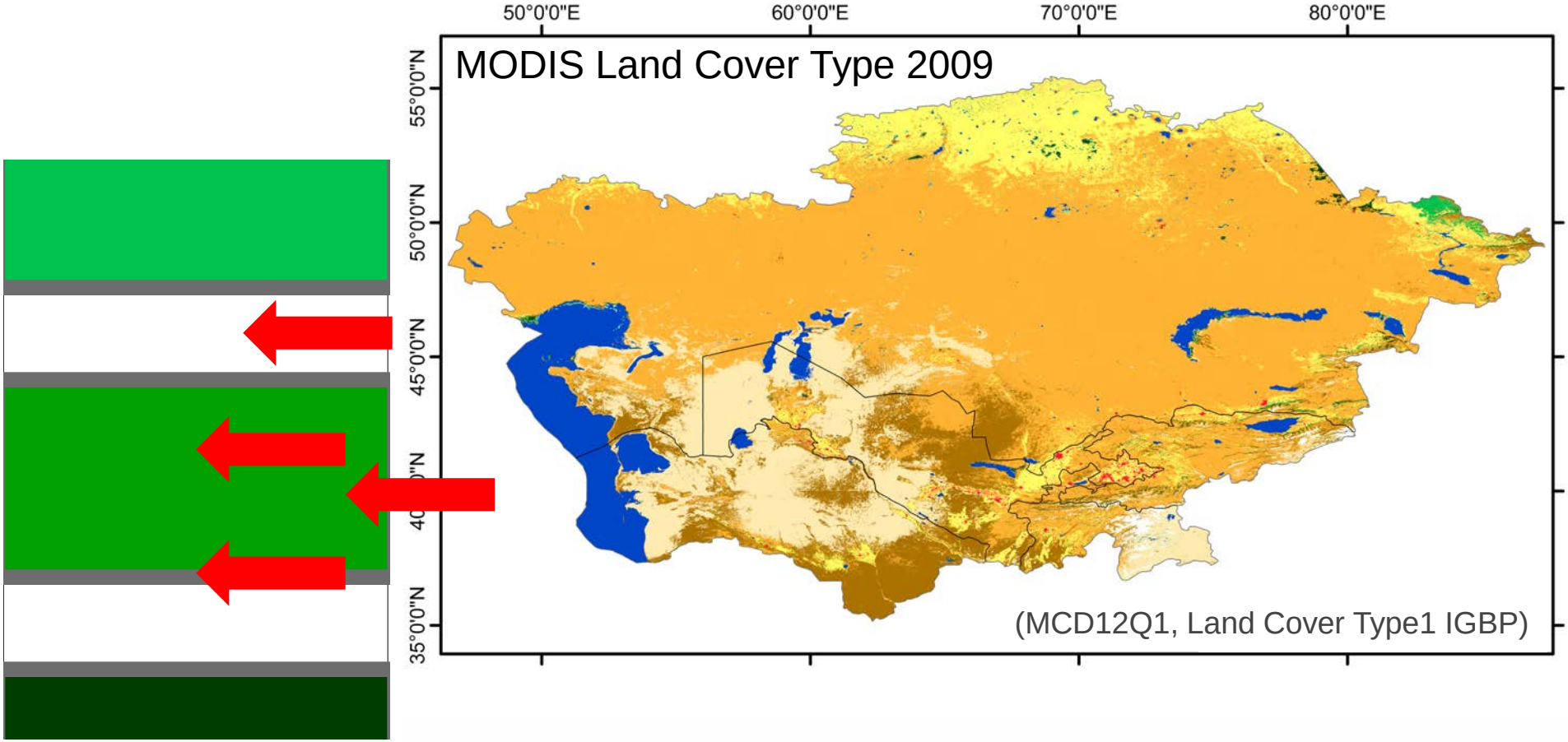
Area extent:
N-S: 2000 km
E-W: 2900 km

Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan, Kazakhstan



EO Products – Land Cover



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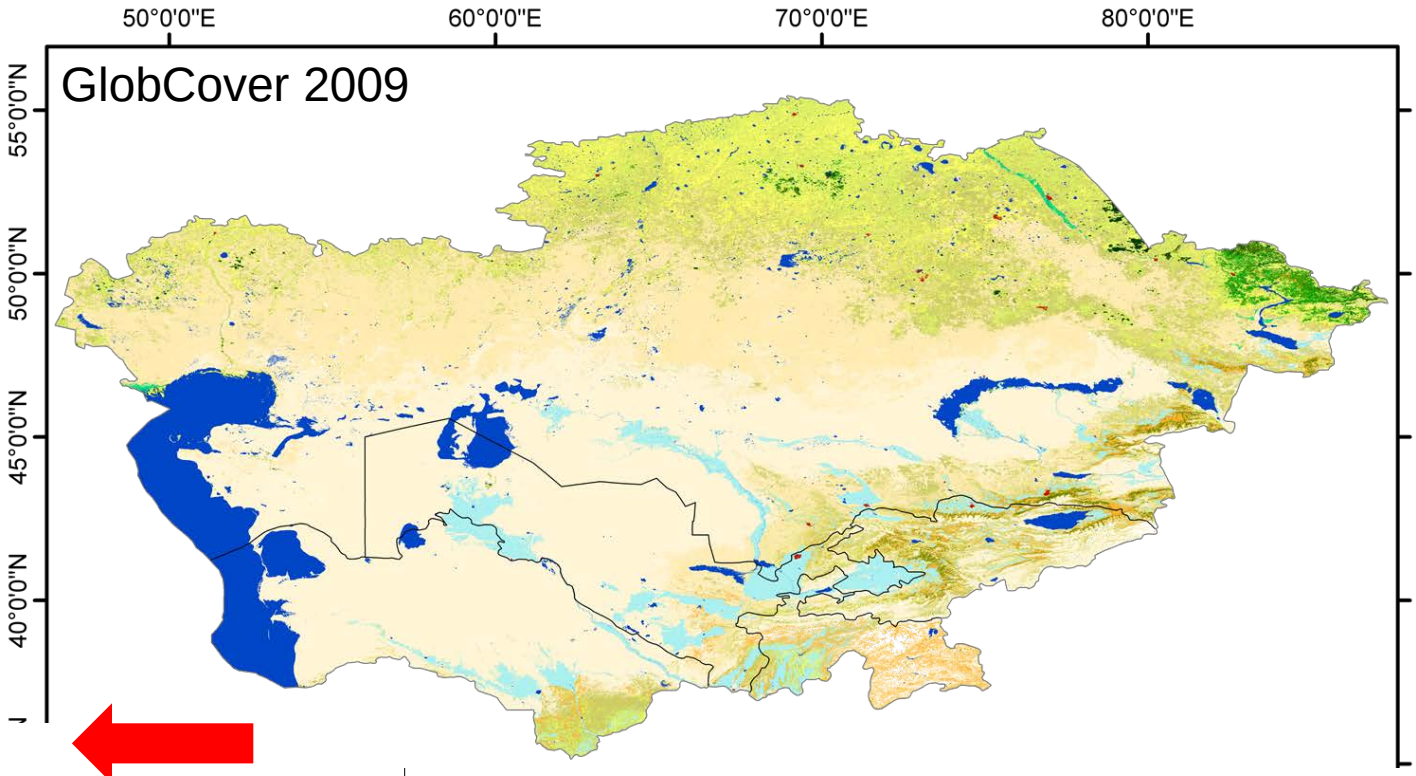
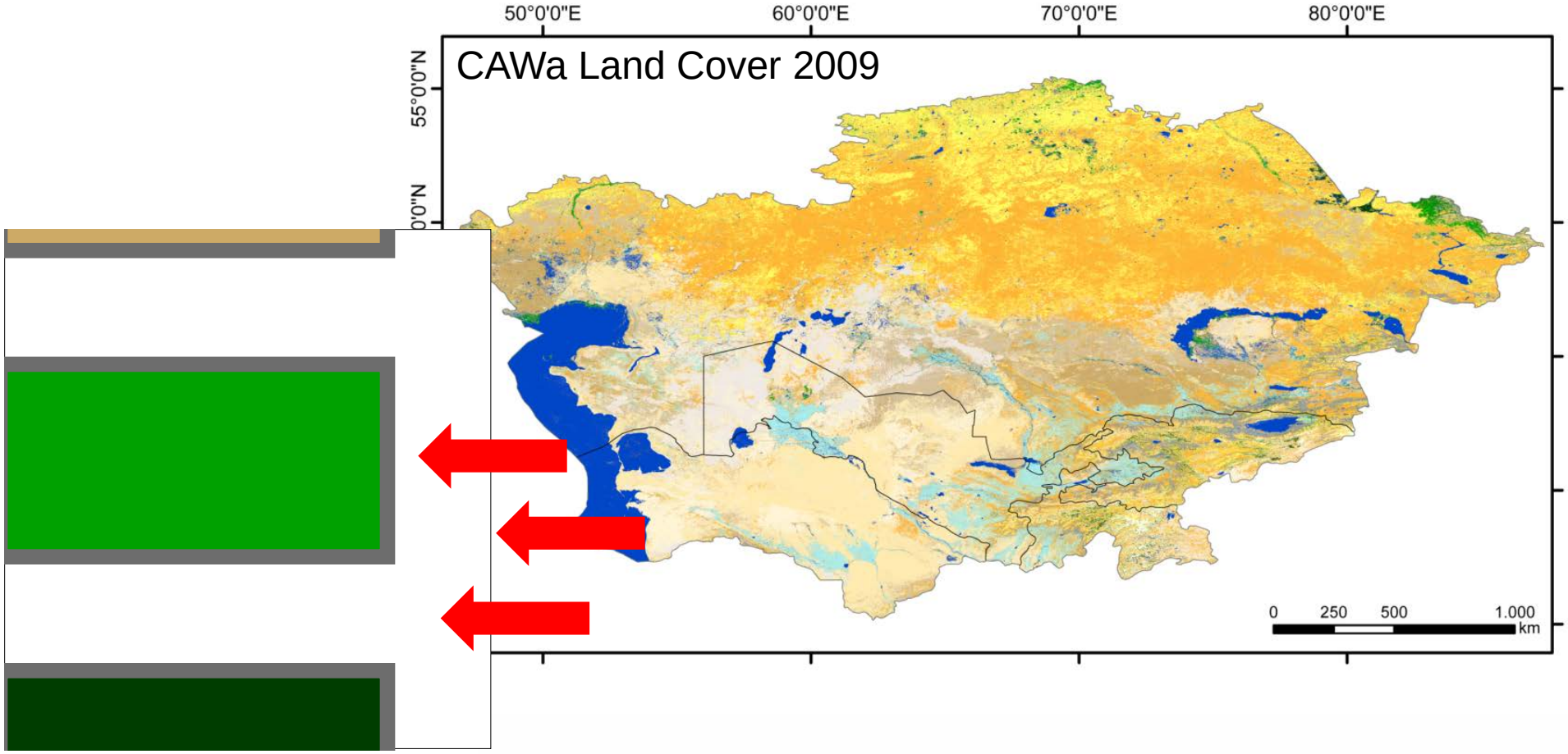
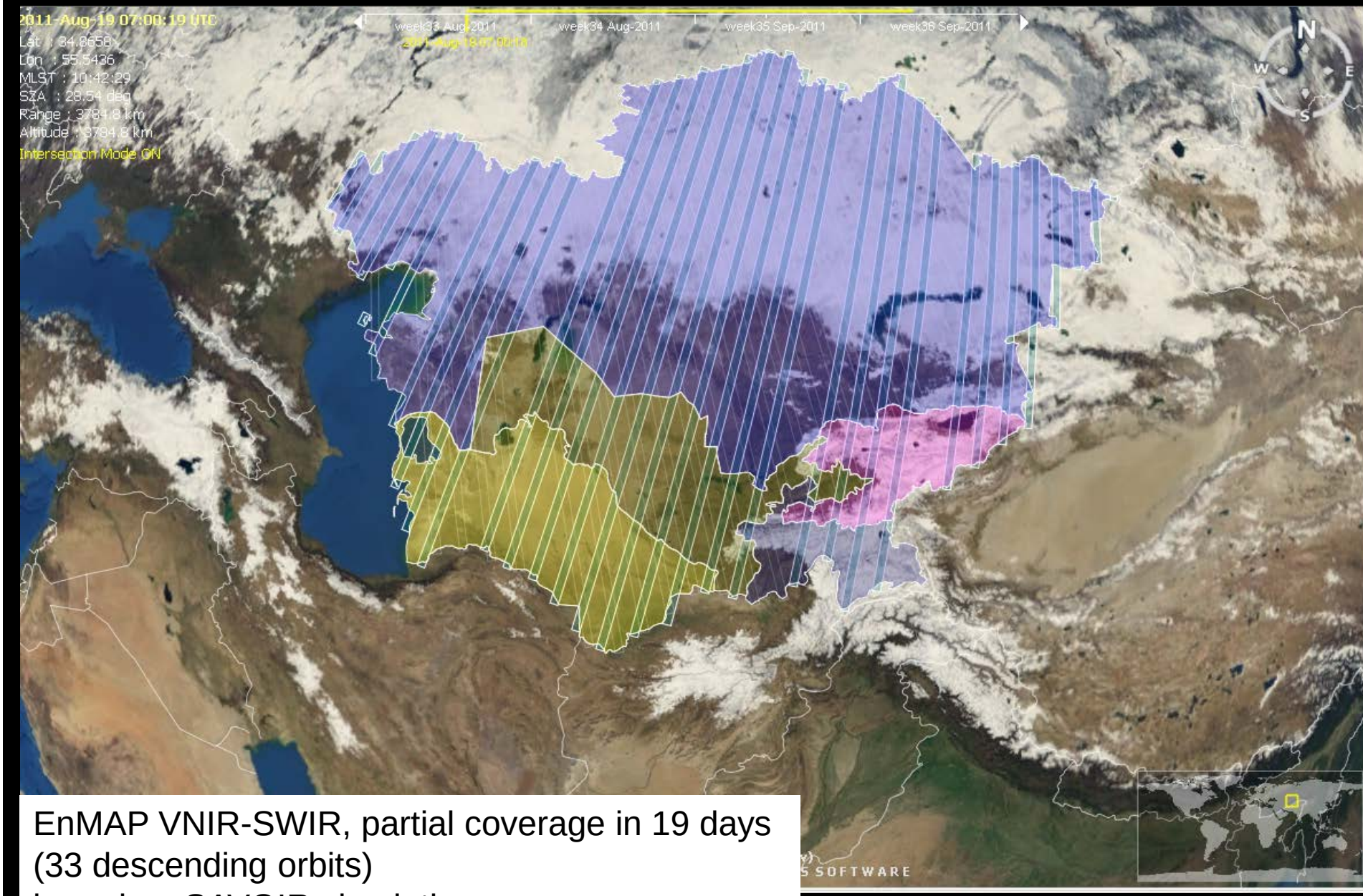
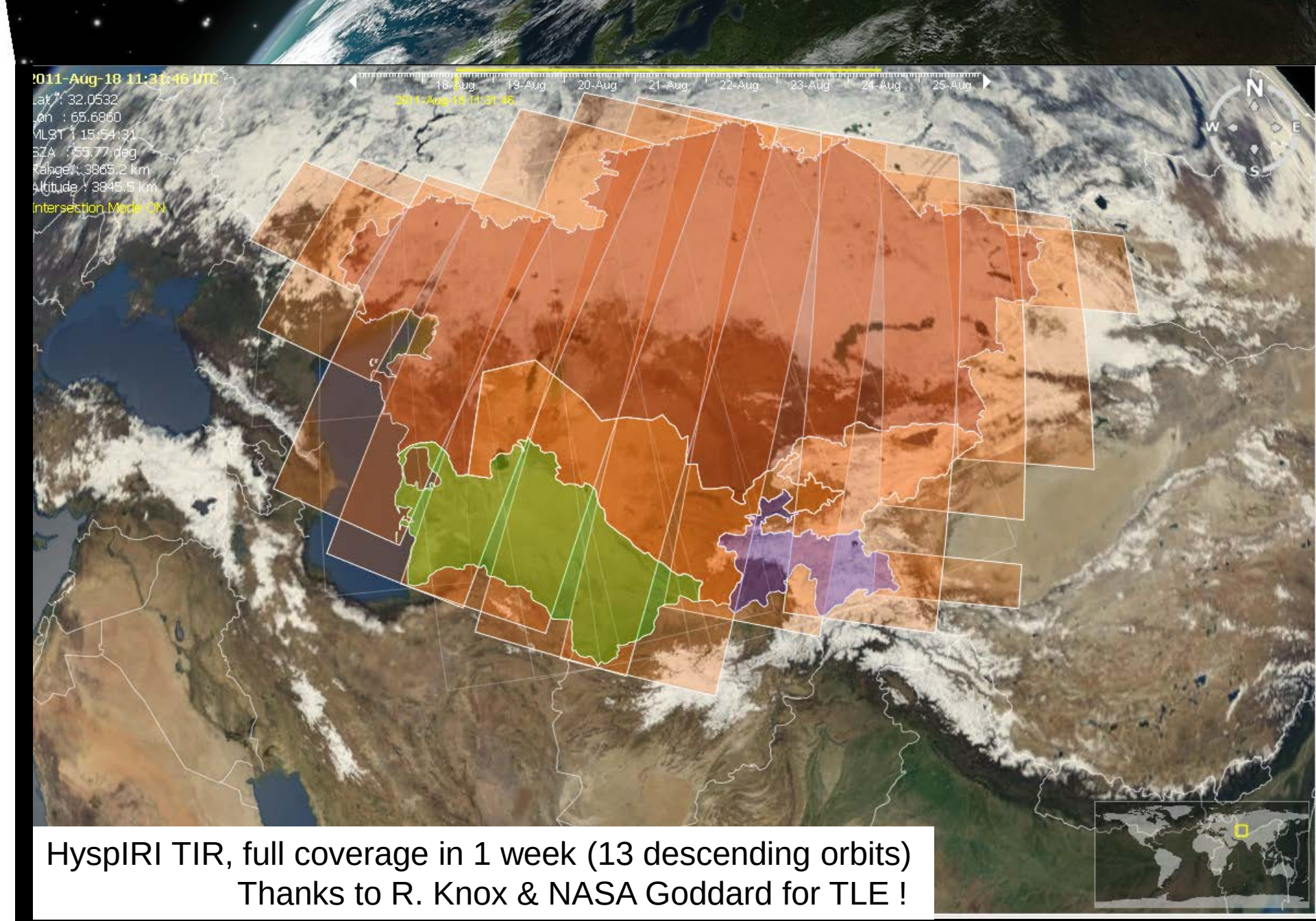


CAWa – Land Cover Mapping for Hydrological Modeling



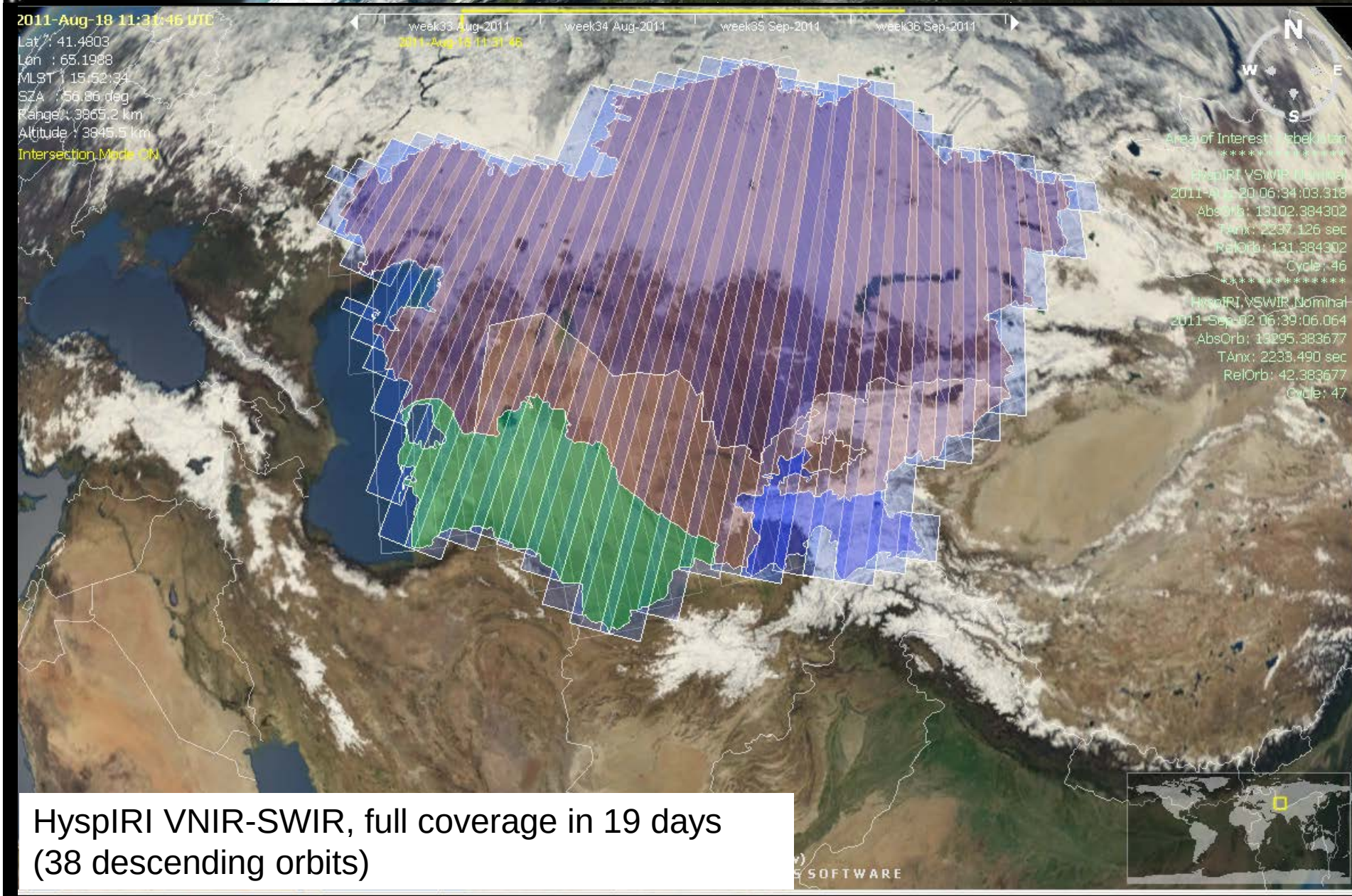


EnMAP VNIR-SWIR, partial coverage in 19 days
(33 descending orbits)
based on SAVOIR simulations



HyspIRI TIR, full coverage in 1 week (13 descending orbits)

Thanks to R. Knox & NASA Goddard for TLE !

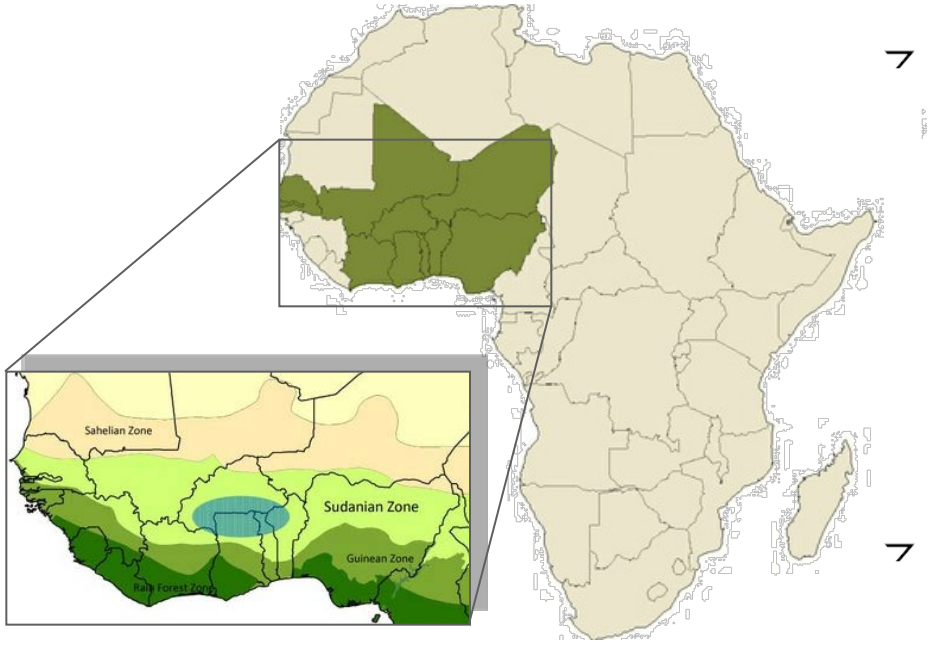


HyspIRI VNIR-SWIR, full coverage in 19 days
(38 descending orbits)

Potential for Adaption of land use to Climate Change in West Africa

ECV‘s	• Improved derivation of Terrestrial **Essential Climate Variables** and further input data for Regional Climate Modelling (e.g. LAI, fAPAR, Fire Disturbance,…)
crop types	• Detailled mapping of crop types and plantations for the assessment of agricultural systems and practices
forest types	• Mapping of forest types for assessing their carbon storage potential and their suitability as habitats
soil properties	• Derivation of **soil properties** for assessing soil degradation state and suitability with regard to different types of land use

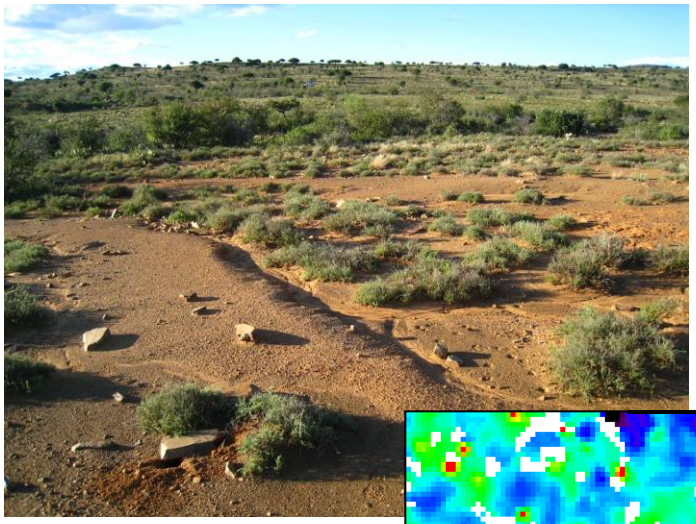
WASCAL – West African Science Service Center on Climate Change and Adapted Land Use

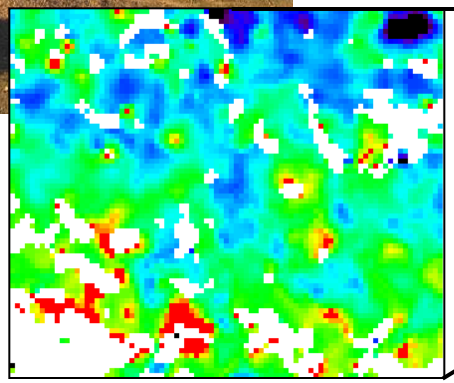


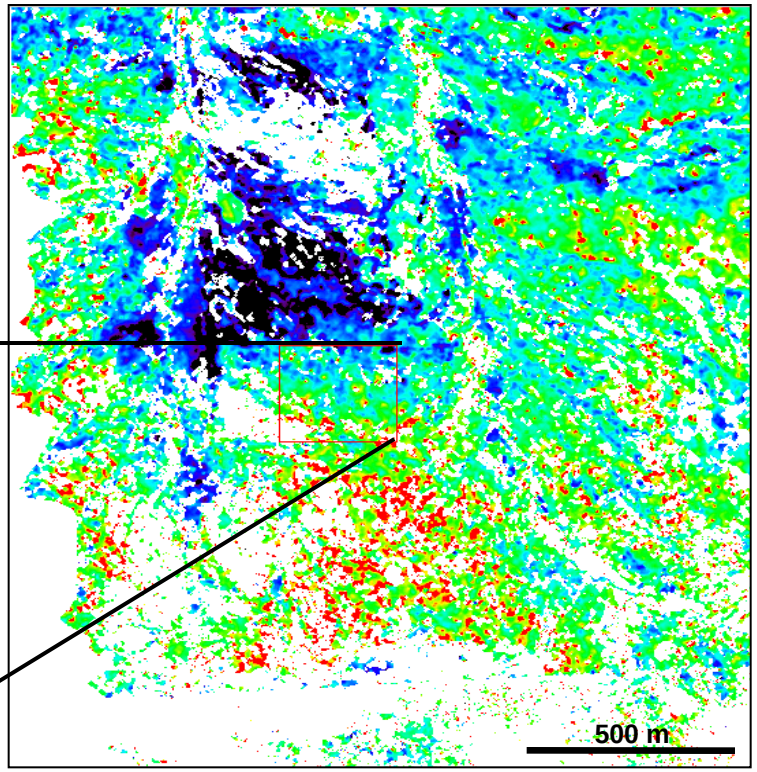
- **Interaction between Land Surface and Regional Climate**
  - interlinking atmospheric modeling systems and enhanced Terrestrial Essential Climate Variables (**ECV's**) from remote sensing
  - understand climate - land surface interactions as a climate and hydrological regulator
- **Income from Carbon Markets**
  - assess the potential impacts of carbon markets on forest cover and income generation with a special focus on poverty alleviation effects (e.g. **REDD+)**

EO-Products – Examples

Quantification of organic carbon in topsoils using hyperspectral EO
Thicket biome, Eastern Cape, ZA







Quantified C_{org}

Monitoring and Observing Environmental and Societal Impacts of Mineral Resources Exploration and Exploitation

mineral abundance

- **Geological / mineral mapping** (reflective & TIR), mining-related change detection

soil & veg. status

- Monitoring the **status of vegetation and soil** in remediation areas and neighboring tailings & slurry basins

coal fires

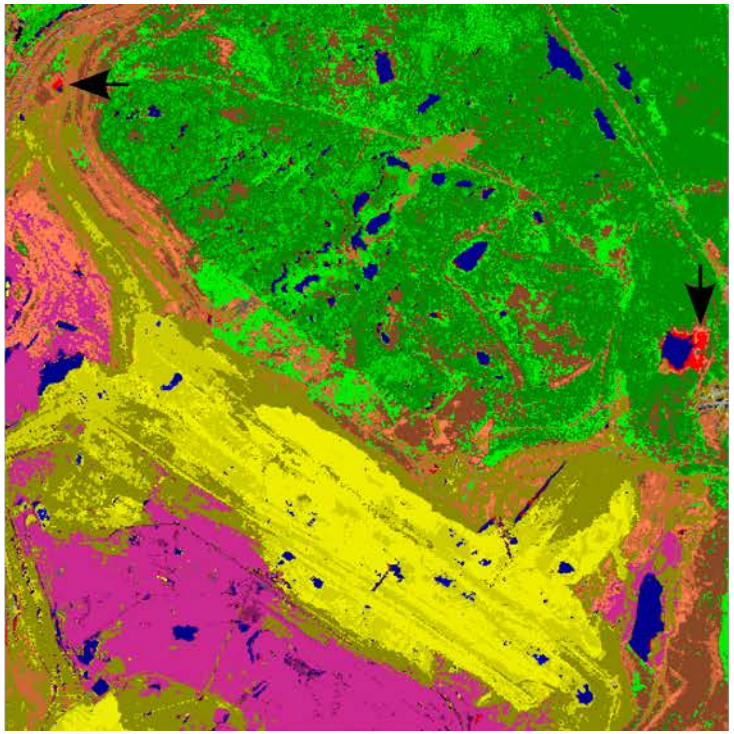
- Detection of **thermal anomalies** / high temperature events related to sub-surface combustion of coal

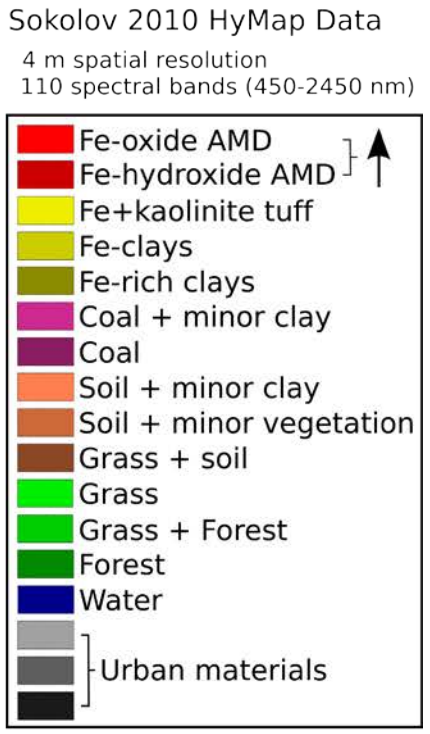
environ. impact

- Monitoring the environmental impact during the full mining life cycle supporting the EC mine waste directive / water framework directive

EO Products – Examples

Addressing the environmental footprint – mapping AMD minerals





Summary Remarks

- Hyperspectral processing techniques & infrastructure available at DLR
- HyspIRI fulfills Data needs of current EO applications with regional focus in terms of:
  - Spectral coverage, sampling and integrity
  - Radiometric performance (i.e. SNR)
  - Revisit time
  - Spatial resolution

- EnMAP will support understanding of terrestrial processes by transect-based analysis
- HyspIRI as a global hyperspectral mapping mission can help solving regional data needs

Expectations

- Improved accuracy for derivation of Essential Climate Variables
- Energy budgets
- Improvements & consistency in LU/LC mapping
- In-depth information on ecosystem status (vegetation status, cover %, …)
- Geo-, biophysical surface parameters (SOM, mineral composition, snow/ice)
- Sub-pixel information about (urban) surface materials

HyspIRI will substantially contribute to an
improved understanding of regional aspects of global change and
will support the implementation of management support systems